REMARKS

Entry of the foregoing amendments and favorable consideration of the subject application is respectfully requested in view of the following comments.

Claims 1-15 are currently pending in this application, claim 1 has been amended and new claims 16-20 have been added. Accordingly, claims 1-20 are herewith presented for the examiner's consideration.

Amendment Of Claims

Claim 1 has been amended in response to the examiner's rejections to limit component (B) "a monofunctional (meth)acrylate" to such compositions which have no hydroxyl group. This limitation is fully supported in the specification as filed at page 8, lines 20-22.

New claims 16-20 have been added herein. New claim 16 presents the composition of the present invention wherein component (B) is particularly identified as "at least one monofunctional (meth)acrylate, having no hydroxyl group and selected from the group consisting of alkyl (meth)acrylates, (poly)alkylene glycol monoalkyl ether (meth)acrylates, fluoroalkyl esters of (meth)acrylic acids, silane compounds having (meth)acryloxyalkyl groups, (meth)acrylates having heterocyclic rings". These particularly preferred options for component (B) are fully supported in the specification as filed at page 9, lines 1-22. New claims 17-20 are dependent from claim

16 and correspond to previously presented claims 2, 3, 5 and 7, respectively.

No further amendments to the claims have been made and Applicants respectfully submit that the amendments made herein are fully supported by the specification as filed and do not introduce any new matter.

Rejection of Claims 1-15 Under 35 U.S.C. §102(b)

Claims 1-15 have been rejected under 35 U.S.C. §102(b) as being anticipated by Fuchigami, et al. (U.S. 5,925,690). The Office Action states:

> "Regarding claim 1: Fuchigami et al. teaches a dental adhesive composition comprising a polyfunctional monomer (component G) based on esters of a polyhydric alcohols (C_3-C_6) and methacrylic acids in 0.1-30 weight%, which contain 1-2 hydroxyl groups (glycerine dimethacrylate) (17:19, 17:33-34); monofunctional methacrylates in an amount of 5-50 weight% and 1-50 weight% (components A and B) (15:27-30; 17:40-48); a polymerizable monomer having an acid group in 1-50 weight% (component B) (15:20-21); and an organoboron compound (22:14-17) in 0.1-20 weight% (27:1-5).
>
> Regarding claim 2: Fuchigamia et al. teaches the basic claimed composition (as set forth above with respect to claim 1) further comprising a filler in 300 weight% or less (27:50-54).
>
> Regarding claim 3: Fuchigami et al. teaches the basic claimed composition (as set forth above with respect to claim 1) further comprising a solvent (component D) in 1-80 weight% (15:43-45).
>
> Regarding claim 4-6: Fuchigami et al. teaches the basic claimed composition (as set forth above with respect to claim 1) wherein the polyfunctional monomer, glycerine dimethacrylate (17:19) [instant claims 5 and 6] is in an amount of 0.1-30 weight% (17:33-34 [instant claim 4].

Regarding claim 7: Fuchigami et al. teaches the basic claimed composition (as set forth above with respect to claim 1) wherein the acid group containing polymerizable monomer is 4-methacryloyloxyethyltrimellitic acid and/or 4-methacryloyloxyethyltrimellitic anhydride (general formula 4) (9:7-9; 9:27-40; 10:27-40).

Regarding claim 8: Fuchigami et al. teaches the basic claimed composition (as set forth above with respect to claim 1) wherein the organoboron compound is tributylborane and/or partially oxidized tributylborane (22:14-17).

Regarding claim 9: Fuchigami et al. teaches the basic claimed composition (as set forth above with respect to claims 1 and 2) wherein the filler is polymethylmethacrylate (22:61-63; 27:41-44).

Regarding claim 10-13: Fuchigami et al. teaches the basic claimed composition (as set forth above with respect to claims 1, 2 and 5) wherein the polyfunctional monomer, glycerine dimethacrylate (17:19) [instant claims 11-13] is in the amount of 0.1-30 weight% (17:33-34) [instant claim 10].

Regarding claim 14: Fuchigami et al. teaches the basic claimed composition (as set forth above with respect to claims 1 and 2) wherein the acid group containing polymerizable monomer is 4-methacryloyloxyethyltrimellitic acid and/or 4-methacryloyloxyethyltrimellitic anhydride (general formula 4) (9:7-9; 9:27-40; 10:27-40).

Regarding claim 15: Fuchigami et al. teaches the basic claimed composition (as set forth above with respect to claims 1 and 2) wherein the organoboron compound is tributylborane and/or partially oxidized tributylborane (22:14-17)."

Applicants respectfully traverse the rejection on the ground that the reference does not teach each and every claimed limitation of the amended claims.

The Federal Circuit has held that anticipation requires that each and every element of the claimed invention be disclosed in a single prior art reference. Verdegaal Bros. v. Union Oil Co. of California, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Those elements must either be inherent or expressly disclosed and must be arranged as in the claim. In re Bond, 15 USPQ2d 1566 (Fed. Cir. 1990). Additionally, there must be no difference between the claimed invention and the reference disclosed, as viewed by a person of ordinary skill in the art. Richardson v. Suzuki Motor Co., 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The prior art reference must also be enabling, thereby placing the allegedly disclosed matter in the possession of the public. In re Brown, 329 F.2d 1006, 1011, 241 USPQ 245, 249 (C.C.P.A. 1964). In order to accomplish this, the reference must be so particular and definite that from it alone, without experiment or the exertion of his own inventive skill, any person versed in the art to which it pertains could construct and use it. Id. at 250.

Finally, the Federal Circuit has made it clear that a negative pregnant is not enough to show anticipation. Rowe v. Dror, 112 F.3d 473, 42 USPQ2d 1550 (Fed. Cir. 1997). Thus, where a reference does not explicitly describe anything inconsistent with a claimed use, if that reference nevertheless fails to make an affirmative suggestion of the claimed limitation, that reference cannot anticipate the claimed use. Id.

Even if the prior art device performs all the functions recited in the claim, the prior art cannot anticipate the claim if there is a structural difference. In re Robertson, 49 USPQ2d 1949, 1951 (Fed. Cir. 1999).

As amended herein, claim 1 now recites:

"A dental adhesive composition comprising:

(A) a polyfunctional polymerizable monomer which is an ester compound of a polyhydric alcohol of 3 to 6 carbon atoms and plural (meth)acrylic acids and has 1 to 2 hydroxyl groups, in an amount of 1 to 30 parts by weight,

(B) a monofunctional (meth)acrylate having no hydroxyl group in an amount of 65 to 95 parts by weight,

(C) a polymerizable monomer having an acid group, in an amount of 1 to 10 parts by weight, and

(D) an organoboron compound in an amount of 0.5 to 10 parts by weight based on 100 parts by weight of the total of the polyfunctional polymerizable monomer (A), the monofunctional (meth)acrylate (B) and the polymerizable monomer (C) having an acid group,

with the proviso that the total of the component (A), the component (B) and the component (C) is 100 parts by weight."

Specifically, component (B) is now recited as "a monofunctional (meth)acrylate, having no hydroxyl group and in an amount of 65 to 95 parts by weight".

In the present office action, the examiner equates the claimed component (B), a monofunctional (meth)acrylate, with component (A) of Fuchigami, et al., which the reference identifies as "a phosphoric acid group-containing monomer" (Col. 2, line 37). Specifically, Fuchigami, et al., identifies its component (A) as follows:

> "The phosphoric acid group-containing monomer (A) used in the present invention is not particularly limited, provided that it is a monomer which is an phosphoric acid ester having in one molecule at least one =P(O)-OH group or a functional group that readily reacts with water as an essential component in the present invention to produce at least one =P(O)-OH group, and a polymerizable unsaturated group." (Col. 2, lines 50-57)

Thus, component (A) of Fuchigami, et al., which the examiner equates to Applicants' component (B), a monofunctional (meth)acrylate, must have at least one hydroxyl -OH group according to the reference's own teaching.

By the amendment herein, Applicants have restricted their monofunctional (meth)acrylate component (B) to those having no hydroxyl group as set forth in the specification at page 8, lines 20-22. Accordingly, it is not possible for the phosphoric acid group-containing monomer (A) of Fuchigami, et al., to be relied upon as a teaching that equates to Applicants' component (B) a monofunctional (meth)acrylate having no hydroxyl group.

Furthermore, in his characterization of Fuchigami's teaching, the examiner seeks to combine Applicants' component

(B), a monofunctional (meth)acrylate in an amount of 65 to 95 parts by weight, and component (C), a polymerizable monomer having an acid group in an amount of 1 to 10 parts by weight, into Fuchigami's component (B) "a carboxylic acid groups-containing monomer", which is disclosed as amounting to 1 to 50% by weight of the reference's composition.

Applicants respectfully submit that the separate recitation of their component (B), "a monofunctional (meth)acrylate having no hydroxyl group in an amount of 65 to 95 parts by weight", and component (C), "a polymerizable monomer having an acid group, in an amount of 1 to 10 parts by weight", clearly identifies these components as separate entities which are not and cannot be taught by Fuchigami's disclosure of a carboxylic acid groups-containing monomer which is present in the reference's composition in an amount of 1 to 50% by weight. Even if one accepts Fuchigami's component (B), a carboxylic acid groups-containing monomer, as equivalent to Applicants' component (C), a polymerizable monomer having an acid group, Fuchigami fails to teach its component (B) as exceeding an amount in the composition of 50% by weight, which it must do if it is to include an equivalent amount of Applicants' claimed component (B) a monofunctional (meth)acrylate having no hydroxyl group in an amount of 65 to 95 parts by weight. Accordingly, Fuchigami's component (B), a carboxylic acid groups-containing monomer, cannot be relied upon to teach either Applicants' component (B),

a monofunctional (meth)acrylate having no hydroxyl group in an amount of 65 to 95 parts by weight, nor the combination of Applicants' component (B) and component (C), a polymerizable monomer having an acid group in an amount of 1 to 10 parts by weight. Applicants' claimed amount of their component (B), a monofunctional (meth)acrylate having no hydroxyl group, is outside the range of and exceeds the amount of Fuchigami's component (B), a carboxylic acid groups-containing monomer as taught by the reference. Similarly, if Fuchigami's teaching of component (B), a carboxylic acid groups-containing monomer, is taken as including the combination of Applicants' components (B) and (C), the amount of the recited monomers to correspond to such a combination is also outside the teaching of Fuchigami for the amount of its component (B).

Furthermore, the examiner's reliance on the disclosure at Column 15, lines 27-30 as support for a teaching of an amount covering that of the combination of Applicants' components (B) and (C) is misplaced since the reference at that point states:

> "The component (A) and the component (B) are preferably contained in a sum amount of 10% or more by weight ..."

Thus, Fuchigami, et al. require both the disclosed component (A), the phosphoric acid group-containing monomer, and component (B), the carboxylic acid groups-containing monomer, in the disclosed sum amount. As pointed out above, Fuchigami et al.'s component

(A) is not includable in Applicants' component (B) by the reference's own definition and, therefore, the sum amount of Fuchigami et al.'s component (A) and component (B) does not and cannot teach the sum amount of Applicants' components (B) and (C).

In view of the foregoing, Applicants respectfully submit that claim 1 is not anticipated under 35 U.S.C. §102(b) by Fuchigami, et al. in that the reference fails to teach each and every element of the claimed invention since the reference does not teach a dental adhesive composition having the recited combination of a monofunctional (meth)acrylate having no hydroxyl group in an amount of 65 to 95 parts by weight and a polymerizable monomer having an acid group in an amount of 1 to 10 parts by weight. Furthermore, there is a distinct difference between the teaching of Fuchigami, et al. and the present invention in the requirement by the reference of the disclosed component (A), a phosphoric acid group-containing monomer which, as is clearly defined in the reference, does not correspond to Applicants' recited component (B), a monofunctional (meth)acrylate, having no hydroxyl group and in an amount of 65 to 95 parts by weight.

As to claims 2-15, since those claims are dependent from claim 1 and thereby include all of the limitations of their parent claim, Applicants respectfully submit that, for the reasons given above with respect to claim 1, claims 2-15 are

likewise not anticipated under 35 U.S.C. §102(b) by Fuchigami, et al.

Applicants respectfully submit that the rejection of claims 1-15 under 35 U.S.C. §102(b) as anticipated by Fuchigami, et al., has been overcome and should be withdrawn.

To the extent that Fuchigami, et al., may be applied against new claims 16-20, Applicants respectfully point out that new claim 16 includes the recitation of component (B) as at least one monofunctional (meth)acrylate having no hydroxyl group and further restricts component (B) to the specifically recited group of methacrylates. Applicants further submit that, for the reasons set forth above in regard to claim 1, the recitation of claim 16 is not anticipated by Fuchigami, et al., such that new claims 16-20 are not considered to be anticipated under 35 U.S.C. 102(b) by Fuchigami, et al.

Rejection of Claims 1-15 under 35 U.S.C. §103(a)

The Office Action rejects claims 1-15 under 35 U.S.C. § 103(a) as being unpatentable over Hashimoto, et al., (U.S. 6,037,388) in view of Rhienberger, et al., (U.S. 6,353,039). The Office Action states:

> "Regarding claim 1: Hashimoto et al. teaches a dental adhesive composition comprising a polymerizable methacrylate monomer in 30-90 weight% (mono and/or polyfunctional), a polymerizable monomer having a carboxylic acid group in 2-20%, an organoboron compound in 1-30 weight%, and polyfunctional polymerizable monomers based on methacrylic acid esters of polyhydric

alcohols, but does not teach such esters that contain 1-2 hydroxyl groups (4:17-25; 9:54-57; 4:36-60; 9:28-47). However, Rhienberger et al. teaches a dental composition comprising dilution monomers (based on methacrylic acid esters), which contain at least 2 polymerizable groups and 1-2 hydroxyl groups (5:29-51). Hashimoto et al. and Rhienberger et al. are combinable because they are concerned with a similar technical difficulty, namely the preparation of dental materials. At the time of invention a person of ordinary skill in the art would have found it obvious to have combined dilution monomers, as taught by Rhienberger et al. in the invention of Hashimoto et al. and would have been motivated to do so since Rhienberger et al. suggests that dilution monomers provide composites with high filler contents (5:30-33), and is an equivalent means of providing a polymerizable composition for dental applications.

Regarding claim 2: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claim 1) further comprising a filler of 0-60 weight% (4:21-22; 10:35-38; 12:23-29; 13:32-40).

Regarding claim 3: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claim 1) further comprising a solvent in 10-150 parts by weight, based on 100 parts organoboron compound, specifically 0.1-45 weight% (2:16-21; 4:17-25).

Regarding claims 4-6: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claim 1), but does not teach polyfunctional polymerizable monomers, based on methacrylic acid esters of polyhydric alcohols, that contain 1-2 hydroxyl groups. However, Rhienberger et al. teaches a dental composition comprising dilution monomers (based on methacrylic acid esters), which contain at least 2 polymerizable groups and 1-2 hydroxyl groups (5:29-51) in 0.1-30 weight% [instant claim 4], specifically glycerol dimethacrylate (5:41-42) [instant claims 5 and 6]. Hashimoto et al. and Rhienberger et al are combinable because they are concerned with a similar technical difficulty, namely the preparation of dental materials. At the time of invention a person of ordinary skill in the art would have found it obvious to have combined dilution monomers (glycerol dimethacrylate), as taught by Rhienberger et al. in the invention of Hashimoto et al., and would have been motivated to do so since Rhienberger et al. suggests

that dilution monomers provide composites with high filler contents (5:30-33), and is an equivalent alternative means of providing a polymerizable composition for dental applications.

Regarding claim 7: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claim 1) wherein the acid group containing polymerizable monomer is 4-methacryloyloxyethyltrimellitic acid and 4-methacryloyloxyethyltrimellitic anhydride (4:36-37).

Regarding claim 8: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claim 1) wherein the organoboron compound is tributylborane and/or partially oxidized tributylborane (2:45-50).

Regarding claim 9: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claim 1) wherein the filler is a polymethylmethacrylate particle (11:334-36).

Regarding claims 10-13: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claims 1, 2 and 5), but does not teach polyfunctional polymerizable monomers, based on methacrylic acid esters of polyhydric alcohols, that contain 1-2 hydroxyl groups. However, Rhienberger et al. teaches a dental composition comprising dilution monomers (based on methacrylic acid esters), which contain at least 2 polymerizable groups and 1-2 hydroxyl groups (5:29-51) in 0.1-30 weight% [instant claim 10], specifically glycerol dimethacrylate (5:41-42) [instant claims 11-13]. Hashimoto et al. and Rhienberger et al. are combinable because they are concerned with a similar technical difficulty, namely the preparation of dental materials. At the time of invention a person of ordinary skill in the art would have found it obvious to have combined dilution monomers (glycerol dimethacrylate), as taught by Rhienberger et al. in the invention of Hashimoto et al., and would have been motivated to do so since Rhienberger et al suggests that dilution monomers provide composites with high filler contents (5:30-33), and is an equivalent alternative means of providing a polymerizable composition for dental applications.

Regarding claim 14: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claims 1 and 2) wherein the acid group containing polymerizable monomer is 4-methacryloyloxyethyltrimellitic acid and 4-methacryloyloxyethyltrimellitic anhydride (4:36-37).

Regarding claim 15: Hashimoto et al. teaches the basic claimed composition (as set forth above with respect to claims 1 and 2) wherein the organoboron compound is tributylborane and/or partially oxidized tributylborane (2:45-50)."

Applicants respectfully traverse the rejections on the ground that a *prima facie* case of obviousness has not been established with respect to the presently pending claims.

The Federal Circuit has ruled that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Feb. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970).

A *prima facie* case of obviousness must also include a showing of the reasons why it would be obvious to modify the references to produce the present invention. See Ex parte Clapp, 277 USPQ 972, 973 (Bd. Pat. App. & Inter. 1985). The examiner bears the initial burden to provide some convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings. Id. at 974.

Applicants respectfully submit that a *prima facie* case of obviousness has not been established as there is no motivation in the prior art to lead one of ordinary skill in the art to modify the teaching of Hashimoto, et al., in view of Rhienberger, et al., to obtain the dental adhesive composition of the present invention.

As recited in claim 1, the present invention is:

"A dental adhesive composition comprising:

(A) a polyfunctional polymerizable monomer which is an ester compound of a polyhydric alcohol of 3 to 6 carbon atoms and plural (meth)acrylic acids and has 1 to 2 hydroxyl groups, in an amount of 1 to 30 parts by weight,

(B) a monofunctional (meth)acrylate, having no hydroxyl group and in an amount of 65 to 95 parts by weight,

(C) a polymerizable monomer having an acid group, in an amount of 1 to 10 parts by weight, and

(D) an organoboron compound in an amount of 0.5 to 10 parts by weight based on 100 parts by weight of the total of the polyfunctional polymerizable monomer (A), the monofunctional (meth)acrylate (B) and the polymerizable monomer (C) having an acid group,

with the proviso that the total of the component (A), the component (B) and the component (C) is 100 parts by weight."

Claims 2-15, as dependent from claim 1, include all of the limitations of their parent claim and the following comments are

equally applicable thereto in response to the examiner's rejection.

As such, the dental adhesive composition comprises:

(A) a polyfunctional polymerizable monomer having 1 to 2 hydroxyl groups,

(B) a monofunctional (meth)acrylate having no hydroxyl group,

(C) a polymerizable monomer having an acid group, and

(D) an organoboron compound.

The composition disclosed in Hashimoto, et al., does not contain a polyfunctional polymerizable monomer, component (A) herein, and, thus, belongs to the compositions represented by Comparative Example 1 of the present invention. As is clearly shown in Examples 1-6 in comparison to Comparative Example 1, the inclusion of the polyfunctional polymerizable monomer in the present invention has the effect of significantly enhancing the curing rate of the resulting adhesive without adversely affecting the adhesion properties of the composition, the properties of the cured product and the working time thereof.

The examiner acknowledges that Hashimoto, et al., fails to teach that the polyfunctional polymerizable monomers based on methacrylic acid esters of a polyhydric alcohol contain 1-2 hydroxyl groups as recited in the present claims, and relies on Rheinberger's disclosure of the inclusion of dilution monomers (based on methacrylic acid esters) which contain at least two

polymerizable groups and 1-2 hydroxyl groups in a dental composite material.

However, Applicants respectfully point out that Hashimoto, et al., is particularly directed to a polymerization initiator for dental and surgical adhesives and includes in such adhesives polymerizable monomers having a carboxylic acid group. Similarly, the present invention recites, as component (C), a polymerizable monomer having an acid group.

Rhienberger, et al., however, specifically exclude the use of acidic monomers in their quest for a polymerizable composite material containing polymerizable monomers and a special transparent glass which exhibits a high release of calcium ions and fluorine ions. The reference notes that prior ion-releasing filling materials made of monomers with carboxyl groups, although displaying a high degree of ion release, have a clear reduction in mechanical properties, in particular strength, after prolonged contact with water. As such, Rhienberger, et al., specifically teach a mixture of at least one non-acidic, non-ionic, hydrophilic crosslinking monomer and at least one non-acid, non-ionic, hydrophilic dilution monomer having a viscosity of less than 1 Pas. (Column 4, lines 53-56).

In defining "non-acidic", Rhienberger, et al., state:

> "The term non-acidic compounds refers to monomers which cry no strongly acidic groups such as carboxyl, phosphoric acid, phosphonic acid, phosphinic acid, or sulphonic acid

> groups and which preferably also contain no weakly acidic groups such as phenolic OH groups, SH groups or CH-acidic groups such as β-diketone groups or β-diketoester groups." (Col. 5, lines 1-7)

With this clear teaching against the use of acidic compounds in the monomers of Rhienberger, et al., Applicants respectfully submit that there would be no motivation to apply any part of this reference in combination with Hashimoto, et al., to achieve the present invention. Since Hashimoto, et al., clearly include acidic monomers, incorporating the teaching of Rhienberger et al., would require ignoring the clear prohibition of the secondary reference against such acidic compounds. As such, there would be no motivation to combine those teachings with the expectation of success argued by either reference. Indeed, the teaching of Rhienberger, et al, is such that one would not expect success with respect to obtaining the degree of ion release and other properties disclosed by the secondary reference if one incorporated its teachings into polymerizable compositions which include the prohibited acidic monomers. Thus, it cannot be said that one of ordinary skill in the art would look to the teaching of Rhienberger, et al., to cure any deficiencies in Hashimoto, et al.

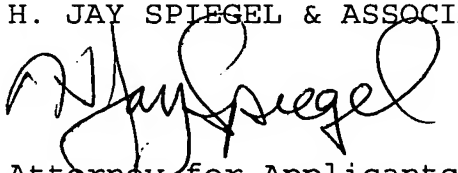
In view of the foregoing, Applicants respectfully submit that a *prima facie* case of obviousness of the present invention has not been established by the combination of Hashimoto, et al., and Rhienberger, et al., and that the rejection of claims 1-15

under 35 U.S.C. §103(a) is without support and should be withdrawn.

Applicants respectfully submit that the rejections of claims 1-15 under 35 U.S.C. §§102(b) and 103(a) have been overcome or are without support and that new claims 16-20 are distinguishable over the prior art for the same reasons given against the rejections of claims 1-15. Accordingly, Applicants respectfully submit that claims 1-20 as presented herein are allowable over the prior art of record and an early notice of allowance is respectfully requested.

Respectfully submitted,

H. JAY SPIEGEL & ASSOCIATES



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